PATENT COOPERATION TREATY

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To:

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12 JUL 2001
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NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL PRELIMINARY EXAMINATION REPORT
(PCT Rule 71.1)

Date of mailing *(day/month/year)*	10.07.2001
Applicant's or agent's file reference: P0547	**IMPORTANT NOTIFICATION**

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/GB00/01735	05/05/2000	08/05/1999

Applicant: SOUTHFIELDS (FABRIC SYSTEMS) LIMITED et al.

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.

2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.

3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

4. **REMINDER**

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

Name and mailing address of the IPEA/	Authorized officer
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Form PCT/IPEA/416 (July 1992)

PCT WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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(71) Applicant *(for all designated States except US)*: SOUTHFIELDS (FABRIC SYSTEMS) LIMITED [GB/GB]; 14 Bakewell Road, Loughborough, Leicestershire LE11 5TL (GB).

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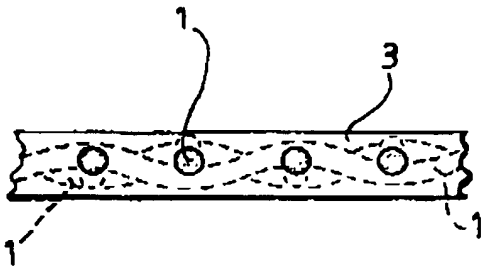
(81) Designated States: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published
With international search report.

(54) Title: COMPOSITE FABRIC AND USE THEREOF

(57) Abstract

A composite fabric comprises a substrate formed of a mesh layer of metal cord 1 and a coating 3 applied to the substrate so as to form a continuous sheet adhered to the substrate. The composite fabric can be used, for example, for architectural applications and also for a curtain for a curtain-sided vehicle body or other goods container. In this case the curtain comprises a sheet of the composite fabric, means to suspend the curtain from an upper portion of the container, and means to secure the curtain in place with respect to the container.



WO 00/68004
PCT/GB00/01735

PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

PCT

NOTICE INFORMING THE APPLICANT OF THE COMMUNICATION OF THE INTERNATIONAL APPLICATION TO THE DESIGNATED OFFICES

(PCT Rule 47.1(c), first sentence)

To:
JACKSON, Derek, Charles
Derek Jackson Associates
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ROYAUME-UNI

2 [illegible] 2000

Date of mailing (day/month/year)	
16 November 2000 (16.11.00)	
Applicant's or agent's file reference P0547	**IMPORTANT NOTICE**
International application No. PCT/GB00/01735	**International filing date** (day/month/year) 05 May 2000 (05.05.00)
Priority date (day/month/year) 08 May 1999 (08.05.99)	
Applicant SOUTHFIELDS (FABRIC SYSTEMS) LIMITED et al	

1. Notice is hereby given that the International Bureau has communicated, as provided in Article 20, the international application to the following designated Offices on the date indicated above as the date of mailing of this Notice:
   AG,AU,DZ,KP,KR,US

   In accordance with Rule 47.1(c), third sentence, those Offices will accept the present Notice as conclusive evidence that the communication of the international application has duly taken place on the date of mailing indicated above and no copy of the international application is required to be furnished by the applicant to the designated Office(s).

2. The following designated Offices have waived the requirement for such a communication at this time:
   AE,AL,AM,AP,AT,AZ,BA,BB,BG,BR,BY,CA,CH,CN,CR,CU,CZ,DE,DK,DM,EA,EE,EP,ES,FI,GB,GD,GE,GH,GM,HR,HU,ID,IL,IN,IS,JP,KE,KG,KZ,LC,LK,LR,LS,LT,LU,LV,MA,MD,MG,MK,MN,MW,MX,NO,NZ,OA,PL,PT,RO,RU,SD,SE,SG,SI,SK,SL,TJ,TM,TR,TT,TZ,UA,UG,UZ,VN,YU,ZA,ZW
   The communication will be made to those Offices only upon their request. Furthermore, those Offices do not require the applicant to furnish a copy of the international application (Rule 49.1(a-bis)).

3. Enclosed with this Notice is a copy of the international application as published by the International Bureau on
   16 November 2000 (16.11.00) under No. WO 00/68004 .

REMINDER REGARDING CHAPTER II (Article 31(2)(a) and Rule 54.2)

If the applicant wishes to postpone entry into the national phase until 30 months (or later in some Offices) from the priority date, a demand for international preliminary examination must be filed with the competent International Preliminary Examining Authority before the expiration of 19 months from the priority date.

It is the applicant's sole responsibility to monitor the 19-month time limit.

Note that only an applicant who is a national or resident of a PCT Contracting State which is bound by Chapter II has the right to file a demand for international preliminary examination.

REMINDER REGARDING ENTRY INTO THE NATIONAL PHASE (Article 22 or 39(1))

If the applicant wishes to proceed with the international application in the national phase, he must, within 20 months or 30 months, or later in some Offices, perform the acts referred to therein before each designated or elected Office.

For further important information on the time limits and acts to be performed for entering the national phase, see the Annex to Form PCT/IB/301 (Notification of Receipt of Record Copy) and Volume II of the PCT Applicant's Guide.

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer J. Zahra
Facsimile No. (41-22) 740.14.35	Telephone No. (41-22) 338.83.38

polyvinylchloride (PVC), polyethylene, polypropylene, polyurethane, polyvinylidenefluoride (PVDF), polytetrafluoroethylene (PTFE) (e.g. TEFLON) or rubber.

Known architectural fabrics all suffer one or more disadvantages. Known substrates all support combustion with the result that a roof of known architectural fabric can quickly collapse in the event of fire. Most known substrates, especially polyester and aramide substrates, deteriorate when exposed to ultraviolet radiation and can only be provided with opaque coatings. Many substrates, especially nylon are susceptible to creep elongation. Many substrates suffer discoloration due to microbe growth in the interstices of the fabric. It is not possible to weld known substrates: current architectural fabrics are joined by stitching or by welding the coating which inevitably results in a fabric strength lower than the strength of the substrate and can, especially in the case of stitching, be difficult to effect for wide spans.

It is therefore an object of the present invention to provide a composite fabric which exhibits greater resistance to damage and/or deterioration.

According to one aspect of the present invention there is provided a composite fabric comprising a substrate and a coating applied to the substrate so as to form a continuous

sheet adhered to the substrate, wherein the substrate comprises a mesh of multifilament metal cord.

The substrate may be woven or unwoven. Ideally, the substrate contains no textile fabric, although the substrate may contain synthetic fibres and the coating may have a textile fabric laminated thereto.

The metal cords of the substrate can be disposed to one another in any convenient manner. Thus, they can, for example, be entwined with one another (for instance by weaving or other textile procedure) or overlaid and secured together, for instance by a melding or a bonding procedure. The metal cords can, for example, be present as continuous or discontinuous strands. Where the substrate is woven the warp and weft cords are conveniently arranged substantially at right angles to each other.

The interstices defined by the metal cords can be of any suitable shape and size. For example, where the cords are disposed in the form of a mesh, for example in a woven pattern or a welded mesh, the interstices of the mesh can be substantially square or of other rectangular shape. The side dimensions of such mesh interstices can be, for example in the range from 0.05 mm to 12 mm, preferably 3 mm to 10 mm, especially 5 mm to 10 mm.

In a further form of the invention the composite fabric contains two or more substrates of multifilament metal cord mesh. This form can comprise, for example, an assembly of two substrates in face-to-face relationship, the outer faces (or outermost faces where there are more than two substrates) having a coating applied thereto. An alternative structure comprises an assembly of two sheets of composite fabric according to the first aspect of the present invention, each sheet comprising a substrate having a coating on both faces thereof and the two sheets of composite fabric being secured together at the interface between adjacent surfaces of coating material. The number of substrates that can be used will depend on their flexibility and on the flexibility required in the composite fabric; the greater the flexibility of the components, especially the substrates, the greater the number of such sheets can be used.

In those embodiments of the composite material of the invention which contain more than one substrate, it is preferred that the pattern of the mesh of the substrate is not coincident in both or, where there are more than two substrates, in all of them, whereby the resistance of the composite fabric to damage, particularly slash attack, is enhanced. This non-coincidental pattern can be effected, for example, by providing that the direction of the metal cords is not identical in the two or more substrates so that the directions of the metal cords in adjacent

substrates are off-set from each other by an angle (for example an angle in the range from 5 degrees to 20 degrees, for instance about 10 degrees) and/or by offsetting the pattern of at least one substrate from that of the other substrate or substrates.

The multiple filaments of the metal cord may be twisted together as one or more strands or groups. The or each filament may have a diameter in the range from 0.05 mm to 1.25 mm, for example about 0.18 mm.

The cords are suitably made of steel in order to provide sufficient strength though, if desired, other metals can be used. The steel, particularly where mild steel is used, or other metal susceptible to corrosion may be provided with a corrosion-resistant coating. Suitable corrosion resistant materials are, for example, those known as being suitable for coating metal cords in radial tyres, for instance zinc, copper or brass. Alternatively the metal may be made of a corrosion-resistant alloy.

One or more strands of synthetic material may be incorporated into all or part of the cord or may be inserted intermediate at least some of the adjacent cords.

The coating may comprise a polymeric material, such as a thermoplastic polymer. The polymeric material may be selected from polyurethane, polyvinylidene fluoride (PVDF),

polytetrafluoroethylene (PTFE) and rubber. The polymeric material may incorporate at least one additional component. The additional component(s) may be selected from fillers, plasticisers, stabilisers, flame retardants, lubricants, pigments and dyes. The coating may be applied to the substrate by one or more of laminating, liquid extrusion and dipping.

The coating material is preferably present on both faces of the substrate. A preferred form of coating material is a layer of polyurethane applied to one or both faces of the substrate. If desired, the polyurethane can be applied to only one face of the substrate but, in general, it is preferred that it be applied to both faces. It is generally found that application of a polyurethane paste to one face of the substrate results in the polyurethane penetrating the interstices of the substrate thereby providing a securement for the coating. It is preferred that, whatever method is used to apply the polyurethane or other polymeric material coating to the substrate, it should result in the coating material becoming firmly bonded to the substrate, for example, by penetrating the interstices (or at least some of the interstices) between the cords of the substrate.

Although the invention is described herein with particular reference to the coating material being coated on the substrate by application of a paste composition, other

means can be used, for example by dipping the substrate into molten or semi-molten coating material, using the coating material in pre-formed sheet form and securing the sheet to the substrate by pressing, rolling or adhesive, or any combination thereof.

There is usually no need to use any supplementary securing means, for example adhesive or other bonding agent, between the substrate and the coating, provided that care is taken to ensure that satisfactory securement is attained, for example using the procedures referred to above.

According to another aspect the present invention there is provided a goods container, such as a curtain-sided vehicle body, provided with a curtain comprising a sheet of a composite fabric according to the first aspect of the invention; means to suspend the curtain from an upper portion of said container; and means to secure the curtain in place with respect to said container.

Whatever coating material is used, it should preferably provide the desirable characteristics of conventional PVC curtains used for curtain-sided vehicles, including flexibility and weather-proof, or at least weather-resistant, capability.

Not all of the composite fabric embodiments referred to in the first aspect of the invention are flexible enough for

satisfactory use in a curtain-sided goods container. However, these more rigid embodiments are suited for use as structural panels for more rigid goods containers, for example motor vans.

A sheet or sheets of composite fabric according to the first aspect of the invention can be used either for the whole area of the curtain or only for part of it. Where the composite fabric is used for the whole area, securement means of a suitable size, for example bolts of small diameter, can be used, said means passing through apertures between adjacent metal cords of the substrate or substrates.

In one form of curtain the composite fabric does not extend as far as the upper edge portion of the curtain, the upper edge portion being provided, for example, by a sheet of conventional curtain material secured to the upper edge of the composite fabric. In practice, this latter arrangement does not detract substantially from the security provided by the curtain, because most attempts to slash conventional curtains are made against the lower portion of the curtain.

For a better understanding of the present invention and to show more clearly how it may be carried into effect reference will now be made, by way of example, to the accompanying drawings in which:

Figure 1 is a plan view of one embodiment of a composite fabric according to the present invention;

Figure 2 a side view of the composite fabric shown in Figure 1;

Figure 3 is an exploded of a part of a curtain-sided container incorporating a curtain including composite fabric as shown in Figures 1 and 2; and

Figure 4 is a cross-sectional view of one embodiment of a detail of the curtain-sided container of Figure 3.

The composite fabric shown in Figures 1 and 2 is intended for use in a curtain of a curtain-sided vehicle body or as an architectural fabric and comprises a substrate in the form of a mesh layer (i.e. a web or net) of metal cord 1 to which is applied a coating 3 of a suitable polymeric material to form a continuous sheet adhered to the substrate. However, it should be noted the composite fabric has other uses, such as floating water tanks for towing fresh water at sea, vandal-resistant coverings for seating, lifting/carrying bags for heavy, sharp materials such as aggregates, gravel and broken stone, and reservoir linings. When used as a curtain for a curtain-sided vehicle body, the composite fabric has the advantage that it is not only resistant to damage by vandals, but it is

also resistant to damage from the vehicle load and /or from a loader for loading and /or unloading the vehicle load.

The substrate is a mesh or fabric, with the cords 1 being composed, for example, of steel and consisting of a plurality of filaments which may be twisted together. A cord composed of a plurality of filaments has the advantage that it is more flexible than a single filament of similar weight per unit length. The number of filaments comprising a cord will depend on the requirements for any particular application, but can readily be determined. For example, nine or twelve filaments are particularly convenient, with the filaments being twisted first in small groups or strands (say three or four, or initially into groups of two and subsequently into groups of four) and the groups or strands then being twisted together. Each filament may have a diameter in the range of, for example, 0.05 mm to 1.25 mm, with adjacent cords being spaced by, for example, 0.05 mm to 10 mm. In one embodiment, both the warp and weft of the substrate may be of steel cord comprising three strands each of three filaments, the filaments having a diameter of about 0.18 mm and having a zinc coating as a corrosion-resistant layer, with adjacent cords being spaced by about 5 mm. The mesh or fabric may be in the form of a plain (square) or twill weave in which warp and weft cords pass under and over each other, an unwoven configuration in which the cords simply pass over each other, or may be knitted. The cords may be all of the same diameter or the

warp cords may have a greater diameter than the weft cords. Alternatively, the weft cords may have a greater diameter than the warp cords.

Ideally the steel is provided with a corrosion-resistant coating, for example it may be galvanised, or the steel may comprise a corrosion-resistant alloy, such as stainless steel. Where coated, the steel may be a low carbon steel having a carbon content of about 0.7 percent by weight. In order that the coating 3 should adhere more firmly to the steel cord, synthetic fibres (such as those conventionally used in architectural fabrics, e.g., nylon or polyester) can be incorporated into all or part of the cord or can be inserted intermediate the warp and/or weft cords.

Steel cords comprising multiple filaments as described possess high tensile strength and high resistance to any kind of damage, whether accidental or deliberate and whether physical or due to exposure to the environment.

The coating 3 comprises a suitable polymeric material, for example a thermoplastic material such as weather-resistant polyurethane (possibly with a flame-retardant finish), PVDF or PTFE. The polymeric material may incorporate one or more additional constituents such as fillers, plasticisers, stabilisers, flame retardants, lubricants, pigments and dyes. The coating is applied by laminating the coating to the surfaces of the substrate, by liquid extrusion onto the

substrate, or by dipping the substrate into a container of molten or semi-molten coating material, or indeed by a combination of extrusion and lamination. Thus, the coating may be transparent, translucent or opaque, may have a gloss or matt finish, may be left uncoated or may be covered with a lacquer or may have a textile material laminated thereto (such as of natural (e.g., cotton) or synthetic material). The overall thickness of the composite fabric may be of the order of 1.5 mm.

The metal cord substrate does not support combustion. Thus, although the coating 3 would degenerate in a fire, the substrate 1 would remain erect longer than a substrate of conventional material. The extension of the life of a building structure in the event of a fire, even if only by one or two minutes, could save lives.

A metal cord substrate has the advantage that it is completely unaffected by sunlight, thus permitting the use of clear, colourless coatings or of highly translucent coloured coatings. The metal cord permits the substrate to have an open mesh structure with the cords relatively widely spaced allowing the ready passage of light.

A metal cord, in particular a steel cord, is additionally relatively immune to creep elongation and does not support microbe growth. Moreover, a metal cord substrate offers

greater security in that it is more difficult to cut the fabric in order to effect unauthorised entry.

A particular advantage of the use of a steel cord is that the material of the substrate becomes weldable thereby resulting in a seam strength substantially the same as that of the substrate itself. This is a very significant advantage over known substrate materials. Alternatively, or additionally, the ends of the steel cord can be clamped to the steel cord substrate of adjoining sheets of the composite fabric or to frame structures or cables, again using the strength of the substrate rather than that of the coating.

The following Table shows, by way of example, characteristics of a woven sheet substrate and its warp and its weft cords. Preferred values for the various characteristics are shown under the heading "preferred range" and specific examples are shown under the heading "example".

CLAIMS

1. A composite fabric comprising a substrate and a coating (3) applied to the substrate so as to form a continuous sheet adhered to the substrate characterised in that the substrate comprises a mesh of multifilament metal cord (1).

2. A composite fabric as claimed in claim 1, characterised in that the substrate is woven and comprises warp and weft cords (1).

3. A composite fabric as claimed in claim 2, characterised in that the warp and weft cords (1) are arranged substantially at right angles to each other.

4. A composite fabric as claimed in any preceding claim, characterised in that interstices between adjacent cords (1) have side dimensions in the range from 0.05 mm to 12 mm.

5. A composite fabric as claimed in claim 4, characterised in that interstices between adjacent cords (1) have side dimensions in the range from 3 mm to 10 mm.

6. A composite fabric as claimed in claim 5, characterised in that interstices between adjacent cords (1) have side dimensions in the range from 5 mm to 10 mm.

7. A composite fabric as claimed in any preceding claim and including two or more substrates of multifilament metal cord mesh.

8. A composite fabric as claimed in claim 7, characterised in that the mesh pattern of at least two substrates is not coincident.

9. A composite fabric as claimed in claim 8, characterised in that the direction of the metal cords (1) is not identical in the at least two substrates.

10. A composite fabric as claimed in claim 9, characterised in that the directions of the metal cords (1) in adjacent substrates are off-set from each other by an angle in the range from 5 degrees to 20 degrees.

11. A composite fabric as claimed in claim 10, characterised in that the angle is about 10 degrees.

12. A composite fabric as claimed in claim 8, characterised in that the pattern of at least one substrate is offset from that of at least another substrate.

13. A composite fabric as claimed in any preceding claim, characterised in that the multiple filaments of the metal cord are twisted together as one or more strands.

14. A composite fabric as claimed in claim 13, characterised in that a plurality of strands are twisted together to form a group.

15. A composite fabric as claimed in any preceding claim, characterised in that the filament diameter is in the range from 0.05 mm to 1.25 mm.

16. A composite fabric as claimed in claim 15, characterised in that the filament diameter is about 0.18 mm.

17. A composite fabric as claimed in any preceding claim, characterised in that the cords (1) are made of steel.

18. A composite fabric as claimed in claim 17, characterised in that the cords (1) are provided with a corrosion-resistant coating.

19. A composite fabric as claimed in any one of claims 1 to 17, characterised in that the cords (1) are made of a corrosion-resistant alloy.

20. A composite fabric as claimed in any preceding claim, characterised in that the coating (3) comprises a polymeric material.

21. A composite fabric as claimed in claim 20, characterised in that the coating (3) comprises a thermoplastic polymer.

22. A composite fabric as claimed in claim 20 or 21, characterised in that the polymeric material selected from the group consisting of polyurethane, polyvinylidene fluoride (PVDF), polytetrafluoroethylene (PTFE) and rubber.

23. A composite fabric as claimed in any one of claims 20 to 22, characterised in that the coating (3) is applied to the substrate by laminating.

24. A composite fabric as claimed in any one of claims 20 to 22, characterised in that the coating (3) is applied to the substrate by liquid extrusion.

25. A composite fabric as claimed in any one of claims 20 to 22, characterised in that the coating (3) is applied to the substrate by dipping the substrate into molten or semi-molten coating material.

26. A goods container provided with a curtain comprising a sheet of a composite fabric as claimed in any preceding claim; means to suspend the curtain from an upper portion of said container; and means to secure the curtain in place with respect to said container.

27. A goods container as claimed in claim 26, characterised in that the composite fabric does not extend as far as the upper edge portion of the curtain.

28. A goods container as claimed in claim 27, characterised in that the upper edge portion of the curtain is provided by a sheet of conventional curtain material secured to the upper edge of the composite fabric.

PATENT COOPERATION TREATY

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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
P0547		
International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/GB00/01735	05/05/2000	08/05/1999
International Patent Classification (IPC) or national classification and IPC B32B15/02		
Applicant SOUTHFIELDS (FABRIC SYSTEMS) LIMITED et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 4 sheets, including this cover sheet.

   ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of 17 sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the report
   - II ☐ Priority
   - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV ☐ Lack of unity of invention
   - V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations suporting such statement
   - VI ☐ Certain documents cited
   - VII ☐ Certain defects in the international application
   - VIII ☐ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
29/11/2000	10.07.2001
Name and mailing address of the international preliminary examining authority: European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Coquelin, J Telephone No. +49 89 2399 8495

Form PCT/IPEA/409 (cover sheet) (January 1994)

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/GB00/01735

I. Basis of the report

1. With regard to the **elements** of the international application *(Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17))*:
Description, pages:

1,2,15-17	as originally filed			
3-14	as received on	30/04/2001	with letter of	27/04/2001

Claims, No.:

1-28	as received on	30/04/2001	with letter of	27/04/2001

Drawings, sheets:

1/2,2/2	as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

   These elements were available or furnished to this Authority in the following language: , which is:

   - ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
   - ☐ the language of publication of the international application (under Rule 48.3(b)).
   - ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

   - ☐ contained in the international application in written form.
   - ☐ filed together with the international application in computer readable form.
   - ☐ furnished subsequently to this Authority in written form.
   - ☐ furnished subsequently to this Authority in computer readable form.
   - ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
   - ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:
- ☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

   (Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-28
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-28
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-28
	No:	Claims	

2. Citations and explanations
   see separate sheet

Item V, novelty and inventive step

None of the documents cited in International Search Report (ISR) would appear to disclose a composite fabric comprising a substrate and a coating applied to the substrate so as to form a continuous sheet adhered to the substrate, the latter comprising a mesh of **multifilament** metal cord. The subject matter of claims 1-28 must therefore be regarded as novel. It must also involve an inventive step since turning from non metal reinforcement, ribbon-like metal reinforcement or single filament cord reinforcement to a multifilament metal cord mesh reinforcement provides advantageous safety as well as flexibility, i.e., properties quite useful in the manufacture of curtains for goods containers.

polyvinylchloride (PVC), polyethylene, polypropylene, polyurethane, polyvinylidenefluoride (PVDF), polytetrafluoroethylene (PTFE) (e.g. TEFLON) or rubber.

Known architectural fabrics all suffer one or more disadvantages. Known substrates all support combustion with the result that a roof or the like of known architectural fabric can quickly collapse in the event of fire. Most known substrates, especially polyester and aramide substrates, deteriorate when exposed to ultraviolet radiation and can only be provided with opaque coatings. Many substrates, especially nylon are susceptible to creep elongation. Many substrates suffer discoloration due to microbe growth in the interstices of the fabric. It is not possible to weld known substrates: current architectural fabrics are joined by stitching or by welding the coating which inevitably results in a fabric strength lower than the strength of the substrate and can, especially in the case of stitching, be difficult to effect for wide spans.

It is therefore an object of the present invention to provide a composite fabric which exhibits greater resistance to damage and/or deterioration.

According to one aspect of the present invention there is provided a composite fabric comprising a substrate formed of a mesh layer of metal cord and a coating applied to the

substrate so as to form a continuous sheet adhered to the substrate.

It should be noted the term "cord" as used herein includes cords having one or more filaments.

The substrate may be woven or unwoven. Ideally, the substrate contains no textile fabric, although the substrate may contain synthetic fibres and the coating may have a textile fabric laminated thereto.

The metal cords of the substrate can be disposed to one another in any convenient manner. Thus, they can, for example, be entwined with one another (for instance by weaving or other textile procedure) or overlaid and secured together, for instance by a melding or a bonding procedure. The metal cords can, for example, be present as continuous or discontinuous strands. Where the substrate is woven the warp and weft cords are conveniently arranged substantially at right angles to each other.

The interstices defined by the metal cords can be of any suitable shape and size. For example, where the cords are disposed in the form of a mesh, for example in a woven pattern or a welded mesh, the interstices of the mesh can be substantially square or of other rectangular shape. The side dimensions of such mesh interstices can be, for

example in the range from 0.05 mm to 12 mm, preferably 3 mm to 10 mm, especially 5 mm to 10 mm.

In a further form of the invention the composite fabric contains two or more substrates. This form can comprise, for example, an assembly of two substrates in face-to-face relationship, the outer faces (or outermost faces where there are more than two substrates) having a coating applied thereto. An alternative structure comprises an assembly of two sheets of composite fabric according to the first aspect of the present invention, each sheet comprising a substrate having a coating on both faces thereof and the two sheets of composite fabric being secured together at the interface between adjacent surfaces of coating material. The number of substrates that can be used will depend on their flexibility and on the flexibility required in the composite fabric; the greater the flexibility of the components, especially the substrates, the greater the number of such sheets can be used.

In those embodiments of the composite material of the invention which contain more than one substrate, it is preferred that the pattern of the mesh of the substrate is not coincident in both or, where there are more than two substrates, in all of them, whereby the resistance of the composite fabric to damage, particularly slash attack, is enhanced. This non-coincidental pattern can be effected,

for example, by providing that the direction of the metal cords is not identical in the two or more substrates so that the directions of the metal cords in adjacent substrates are off-set from each other by an angle (for example an angle in the range from 5 degrees to 20 degrees, for instance about 10 degrees) and/or by offsetting the pattern of at least one substrate from that of the other substrate or substrates.

The cord may comprise a single filament or multiple filaments. Where multiple filaments are provided they may be twisted together as one or more strands or groups. The or each filament may have a diameter in the range from 0.05 mm to 1.25 mm, for example about 0.18 mm.

The cords are suitably made of steel in order to provide sufficient strength though, if desired, other metals can be used. The steel, particularly where mild steel is used, or other metal susceptible to corrosion may be provided with a corrosion-resistant coating. Suitable corrosion resistant materials are, for example, those known as being suitable for coating metal cords in radial tyres, for instance zinc, copper or brass. Alternatively the metal may comprise a corrosion-resistant alloy.

One or more strands of synthetic material may be incorporated into all or part of the cord or may be inserted intermediate at least some of the adjacent cords.

The coating may comprise a polymeric material, such as a thermoplastic polymer. The polymeric material may be selected from polyurethane, polyvinylidene fluoride (PVDF), polytetrafluoroethylene (PTFE) and rubber. The polymeric material may incorporate at least one additional component. The additional component(s) may be selected from fillers, plasticisers, stabilisers, flame retardants, lubricants, pigments and dyes. The coating may be applied to the substrate by one or more of laminating, liquid extrusion and dipping.

The coating material is preferably present on both faces of the substrate. A preferred form of coating material is a layer of polyurethane applied to one or both faces of the substrate. If desired, the polyurethane can be applied to only one face of the substrate but, in general, it is preferred that it be applied to both faces. It is generally found that application of a polyurethane paste to one face of the substrate results in the polyurethane penetrating the interstices of the substrate thereby providing a securement for the coating. It is preferred that, whatever method is used to apply the polyurethane or other polymeric material coating to the substrate, it should result in the coating material becoming firmly bonded to the substrate, for example, by penetrating the interstices (or at least some of the interstices) between the cords of the substrate.

Although the invention is described herein with particular reference to the coating material being coated on the substrate by application of a paste composition, other means can be used, for example by dipping the substrate into molten or semi-molten coating material, using the coating material in pre-formed sheet form and securing the sheet to the substrate by pressing, rolling or adhesive, or any combination thereof.

There is usually no need to use any supplementary securing means, for example adhesive or other bonding agent, between the substrate and the coating, provided that care is taken to ensure that satisfactory securement is attained, for example using the procedures referred to above.

According to another aspect the present invention there is provided a curtain for a curtain-sided vehicle body or other goods container, which comprises a sheet of a composite fabric according to the first aspect of the invention; means to suspend the curtain from an upper portion of said container; and means to secure the curtain in place with respect to said container.

Whatever, coating material is used it should preferably provide the desirable characteristics of conventional PVC curtains used for curtain-sided vehicles, including flexibility and weather-proof, or at least weather-resistant, capability.

Not all of the composite fabric embodiments referred to in the first aspect of the invention are flexible enough for satisfactory use in a curtain-sided goods container. However, these more rigid embodiments are suited for use as structural panels for more rigid goods containers, for example motor vans.

A sheet or sheets of composite fabric according to the first aspect of the invention can be used either for the whole area of the curtain or only for part of it. Where the composite fabric is used for the whole area, securement means of a suitable size, for example bolts of small diameter, can be used said means passing through apertures between adjacent metal cords of the substrate or substrates.

In one form of curtain of the present invention the composite fabric does not extend as far as the upper edge portion of the curtain, the upper edge portion being provided, for example, by a sheet of conventional curtain material secured to the upper edge of the composite fabric. In practice, this latter arrangement does not detract substantially from the security provided by the curtain, because most attempts to slash conventional curtains are made against the lower portion of the curtain.

For a better understanding of the present invention and to show more clearly how it may be carried into effect

reference will now be made, by way of example, to the accompanying drawings in which:

Figure 1 is a plan view of one embodiment of a composite fabric according to the present invention;

Figure 2 a side view of the composite fabric shown in Figure 1;

Figure 3 is an exploded of a part of a curtain-sided container incorporating a curtain including composite fabric as shown in Figures 1 and 2; and

Figure 4 is a cross-sectional view of one embodiment of a detail of the curtain-sided container of Figure 3.

The composite fabric shown in Figures 1 and 2 is intended for use in a curtain of a curtain-sided vehicle body or as an architectural fabric and comprises a substrate in the form of a mesh layer (i.e. a web or net) of metal cord 1 to which is applied a coating 3 of a suitable polymeric material to form a continuous sheet adhered to the substrate. However, it should be noted the composite fabric has other uses, such as floating water tanks for towing fresh water at sea, vandal-resistant coverings for seating, lifting/carrying bags for heavy, sharp materials such as aggregates, gravel, broken stone and the like, and reservoir linings. When used as a curtain for a curtain-

sided vehicle body, the composite fabric has the advantage that it is not only resistant to damage by vandals, but it is also resistant to damage from the vehicle load and /or from a loader for loading and /or unloading the vehicle load.

The substrate is a mesh or fabric, with the cords 1 being composed, for example, of steel and comprising a single filament or a plurality of filaments which may be twisted together. A cord composed of a plurality of filaments has the advantage that it is more flexible than a single filament of similar weight per unit length. The number of filaments comprising a cord will depend on the requirements for any particular application, but can readily be determined. For example, nine or twelve filaments are particularly convenient, with the filaments being twisted first in small groups or strands (say three or four, or initially into groups of two and subsequently into groups of four) and the groups or strands then being twisted together. The or each filament may have a diameter in the range of, for example, 0.05 mm to 1.25 mm, with adjacent cords being spaced by, for example, 0.05 mm to 10 mm. In one embodiment, both the warp and weft of the substrate may be of steel cord comprising three strands each of three filaments, the filaments having a diameter of about 0.18 mm and having a zinc coating as a corrosion-resistant layer, with adjacent cords being spaced by about 5 mm. The mesh or fabric may be in the form of a plain (square) or twill

weave in which warp and weft cords pass under and over each other, an unwoven configuration in which the cords simply pass over each other, or may be knitted. The cords may be all of the same diameter or the warp cords may have a greater diameter than the weft cords. Alternatively, the weft cords may have a greater diameter than the warp cords.

Ideally the steel is provided with a corrosion-resistant coating, for example it may be galvanised, or the steel may comprise a corrosion-resistant alloy, such as stainless steel. Where coated, the steel may be a low carbon steel having a carbon content of about 0.7 percent by weight. In order that the coating 3 should adhere more firmly to the steel cord, synthetic fibres (such as those conventionally used in architectural fabrics, e.g., nylon or polyester) can be incorporated into all or part of the cord or can be inserted intermediate the warp and/or weft cords.

Steel cords comprising multiple filaments as described possess high tensile strength and high resistance to any kind of damage, whether accidental or deliberate and whether physical or due to exposure to the environment.

The coating 3 comprises a suitable polymeric material, for example a thermoplastic material such as weather-resistant polyurethane (possibly with a flame-retardant finish), PVDF or PTFE. The polymeric material may incorporate one or more additional constituents such as fillers, plasticisers,

stabilisers, flame retardants, lubricants, pigments and dyes. The coating is applied by laminating the coating to the surfaces of the substrate, by liquid extrusion onto the substrate, or by dipping the substrate into a container of molten or semi-molten coating material, or indeed by a combination of extrusion and lamination. Thus, the coating may be transparent, translucent or opaque, may have a gloss or matt finish, may be left uncoated or may be covered with a lacquer or may have a textile material laminated thereto (such as of natural (e.g., cotton) or synthetic material). The overall thickness of the composite fabric may be of the order of 1.5 mm.

The metal cord substrate does not support combustion. Thus, although the coating 3 would degenerate in a fire, the substrate 1 would remain erect longer than a substrate of conventional material. The extension of a building structure in the event of a fire, even if only by one or two minutes, could save lives.

A metal cord substrate has the advantage that it is completely unaffected by sunlight, thus permitting the use of clear, colourless coatings or of highly translucent coloured coatings. The metal cord permits the substrate to have an open mesh structure with the cords relatively widely spaced allowing the ready passage of light.

A metal cord, in particular a steel cord, is additionally relatively immune to creep elongation and does not support microbe growth. Moreover, a metal cord substrate offers greater security in that it is more difficult to cut the fabric in order to effect unauthorised entry.

A particular advantage of the use of a steel cord is that the material of the substrate becomes weldable thereby resulting in a seam strength substantially the same as that of the substrate itself. This is a very significant advantage over known substrate materials. Alternatively, or additionally, the ends of the steel cord can be clamped to the steel cord substrate of adjoining sheets of the composite fabric or to frame structures or cables, again using the strength of the substrate rather than that of the coating.

The following Table shows, by way of example characteristics of a woven sheet substrate and its warp and its weft cords. Preferred values for the various characteristics are shown under the heading "preferred range" and specific examples are shown under the heading "example".

CLAIMS

1. A composite fabric comprising a substrate formed of a mesh layer of metal cord (1) and a coating (3) applied to the substrate so as to form a continuous sheet adhered to the substrate.

2. A composite fabric as claimed in claim 1, characterised in that the substrate is woven and comprises warp and weft cords (1).

3. A composite fabric as claimed in claim 2, characterised in that the warp and weft cords (1) are arranged substantially at right angles to each other.

4. A composite fabric as claimed in any preceding claim, characterised in that interstices between adjacent cords (1) have side dimensions in the range from 0.05 mm to 12 mm.

5. A composite fabric as claimed in claim 4, characterised in that interstices between adjacent cords (1) have side dimensions in the range from 3 mm to 10 mm.

6. A composite fabric as claimed in claim 5, characterised in that interstices between adjacent cords (1) have side dimensions in the range from 5 mm to 10 mm.

7. A composite fabric as claimed in any preceding claim and including two or more substrates.

8. A composite fabric as claimed in claim 7, characterised in that the mesh pattern of at least two substrates is not coincident.

9. A composite fabric as claimed in claim 8, characterised in that the direction of the metal cords (1) is not identical in the at least two substrates.

10. A composite fabric as claimed in claim 9, characterised in that the directions of the metal cords (1) in adjacent substrates are off-set from each other by an angle in the range from 5 degrees to 20 degrees.

11. A composite fabric as claimed in claim 10, characterised in that the angle is about 10 degrees.

12. A composite fabric as claimed in claim 8, characterised in that the pattern of at least one substrate is offset from that of at least another substrate.

13. A composite fabric as claimed in any preceding claim, characterised in that the cord (1) comprises a single filament.

14. A composite fabric as claimed in any one of claims 1 to 12, characterised in that the cord (1) comprises multiple filaments.

15. A composite fabric as claimed in claim 14, characterised in that the multiple filaments are twisted together as one or more strands.

16. A composite fabric as claimed in claim 15, characterised in that a plurality of strands are twisted together to form a group.

17. A composite fabric as claimed in any one of claims 13 to 16, characterised in that the filament diameter is in the range from 0.05 mm to 1.25 mm.

18. A composite fabric as claimed in claim 17, characterised in that the filament diameter is about 0.18 mm.

19. A composite fabric as claimed in any preceding claim, characterised in that the cords (1) are made of steel.

20. A composite fabric as claimed in claim 19, characterised in that the cords (1) are provided with a corrosion-resistant coating.

21. A composite fabric as claimed in any one of claims 1 to 19, characterised in that the cords (1) comprise a corrosion-resistant alloy.

22. A composite fabric as claimed in any preceding claim, characterised in that the coating (3) comprises a polymeric material.

23. A composite fabric as claimed in claim 22, characterised in that the coating (3) comprises a thermoplastic polymer.

24. A composite fabric as claimed in claim 22 or 23, characterised in that the polymeric material selected from the group consisting of polyurethane, polyvinylidene fluoride (PVDF), polytetrafluoroethylene (PTFE) and rubber.

25. A composite fabric as claimed in any one of claims 22 to 24, characterised in that the coating (3) is applied to the substrate by laminating.

26. A composite fabric as claimed in any one of claims 22 to 25, characterised in that the coating (3) is applied to the substrate by liquid extrusion.

27. A composite fabric as claimed in any one of claims 22 to 26, characterised in that the coating (3) is applied to

the substrate by dipping the substrate into molten or semi-molten coating material.

28. A curtain for a curtain-sided vehicle body or other goods container, which comprises a sheet of a composite fabric as claimed in any preceding claim; means to suspend the curtain from an upper portion of said container; and means to secure the curtain in place with respect to said container.

29. A curtain as claimed in claim 28, characterised in that the composite fabric does not extend as far as the upper edge portion of the curtain.

30. A curtain as claimed in claim 29, characterised in that the upper edge portion of the curtain is provided by a sheet of conventional curtain material secured to the upper edge of the composite fabric.

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1. The designated Office is hereby notified of its election made:

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